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An Innovative Approach to Lower the Risk of Software-Intensive Development Programs

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An Innovative Approach to Lower the Risk of Software Intensive Development Programs

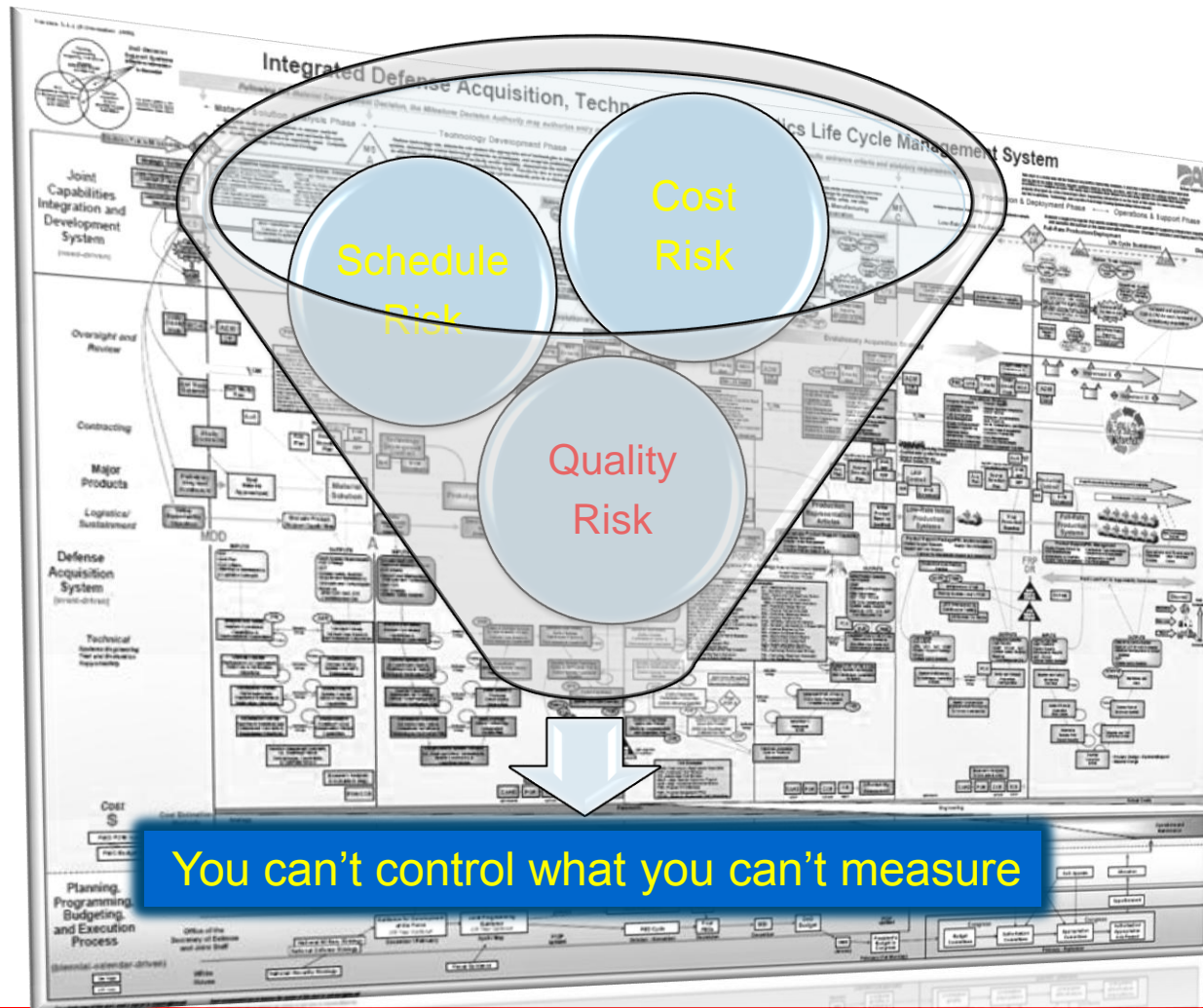
Jeff Dunlap

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Jeff.dunlap@baesystems.com



Assertion: Less risk = greater probability of success

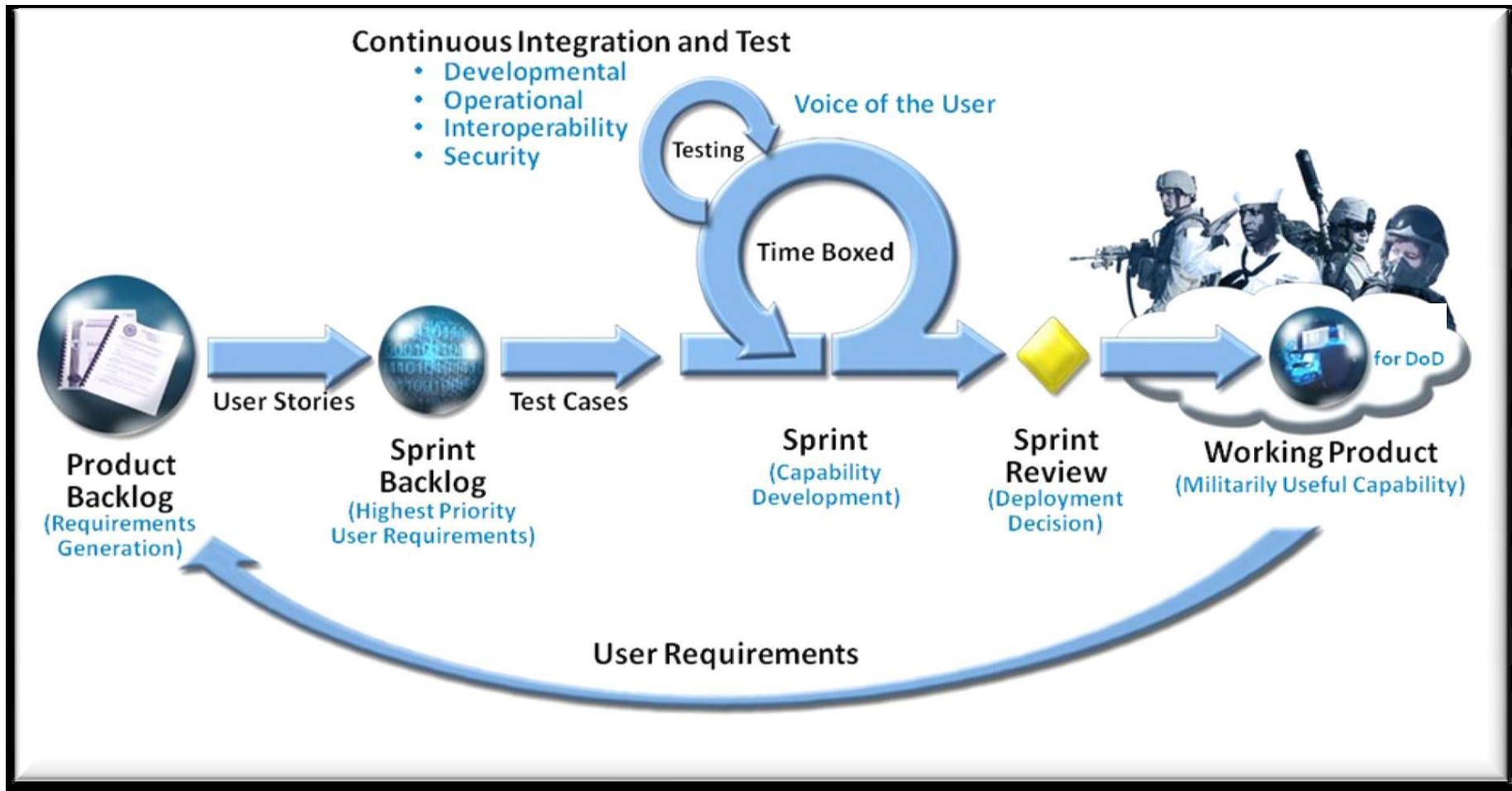


Elements needed to control risk

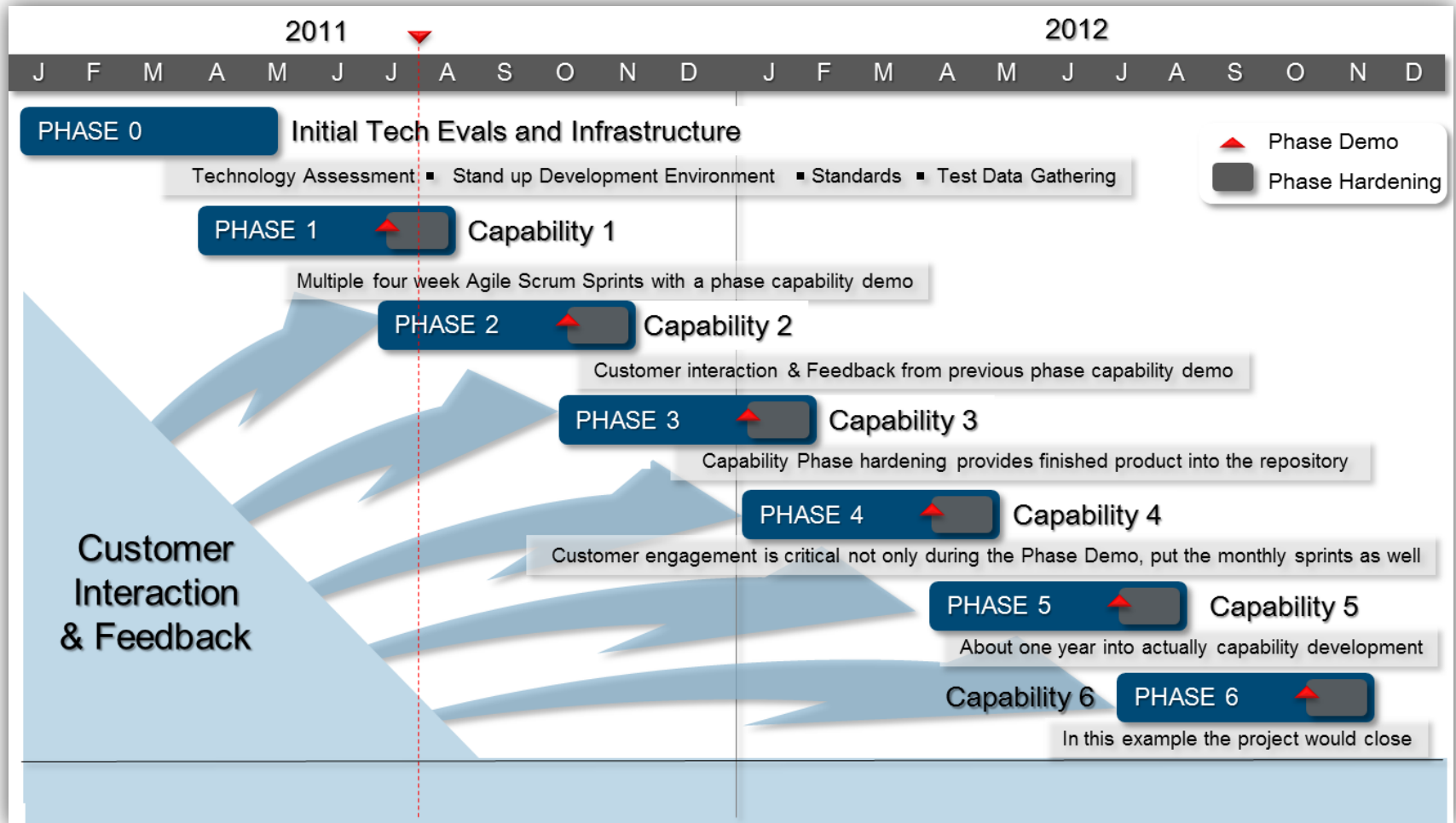
- ☑ constant measure of schedule achieved
 - ☑ constant measure of actual cost incurred
 - ☑ constant measure of quality tested
-
- ☑ Agile Earned Value



Agile Development



Industry example of a System Capability Roadmap



Agile four week Scrum Sprint within a capability phase

Week 1	Mon	Tues	Wed	Thrs	
Team			daily SCRUM	daily SCRUM	Off Friday
Leads & CE	Story Prioritization		SCRUM of SCRUMS	SCRUM of SCRUMS	
Leads	Move Stories into JIRA				
		Move Tasks into JIRA			
Team	Bugs & Improvements				
	Design, Deliver, Accept - Update JIRA Status daily				
	Backlog prep for next Sprint				
All			Weekly Team Meeting		
PM	Determine Velocity / Feedback Loop to Planning		Status GreenHopper Tasks & Stories		
Week 2	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS
	Bugs & Improvements				
Team	Design, Deliver, Accept - Update JIRA Status daily				
	Backlog prep for next Sprint				
All			Weekly Team Meeting		
PM	Status GreenHopper Tasks & Stories				
Week 3	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	Off Friday
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	
	Bugs & Improvements				
Team	Design, Deliver, Accept - Update JIRA Status daily				
	Backlog prep for next Sprint				
All			Weekly Team Meeting		
PM	Status GreenHopper Tasks & Stories				
Week 4	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	
Leads & CE		Propose Next-Sprint Stories, Review Backlog			
	Bugs & Improvements				
	Design, Deliver, Accept - Update JIRA Status daily			JIRA Close-out	
	Backlog prep for next Sprint			Sprint Release / Design Review / Demo	
			Weekly Team Meeting		Retrospective
	Status GreenHopper Tasks & Stories			Run Final Reports / Update Velocity	

Constant measure of schedule achieved

Constant measure of actual costs incurred

Measure of quality tested

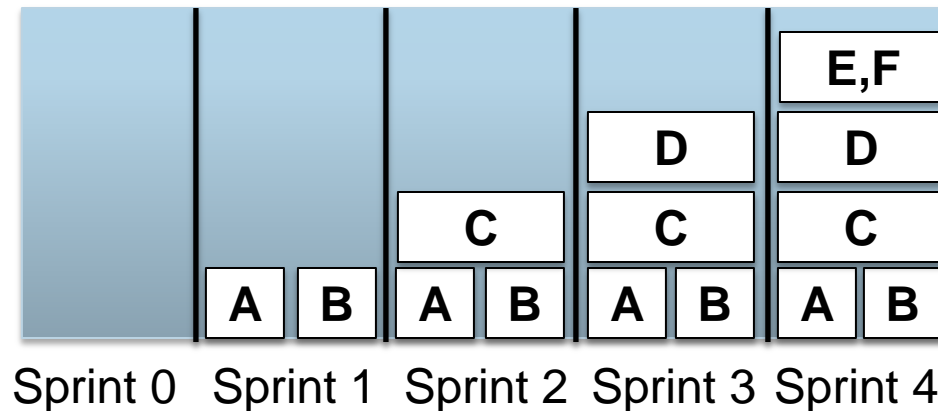


Traditional vs. Agile Testing

Traditional

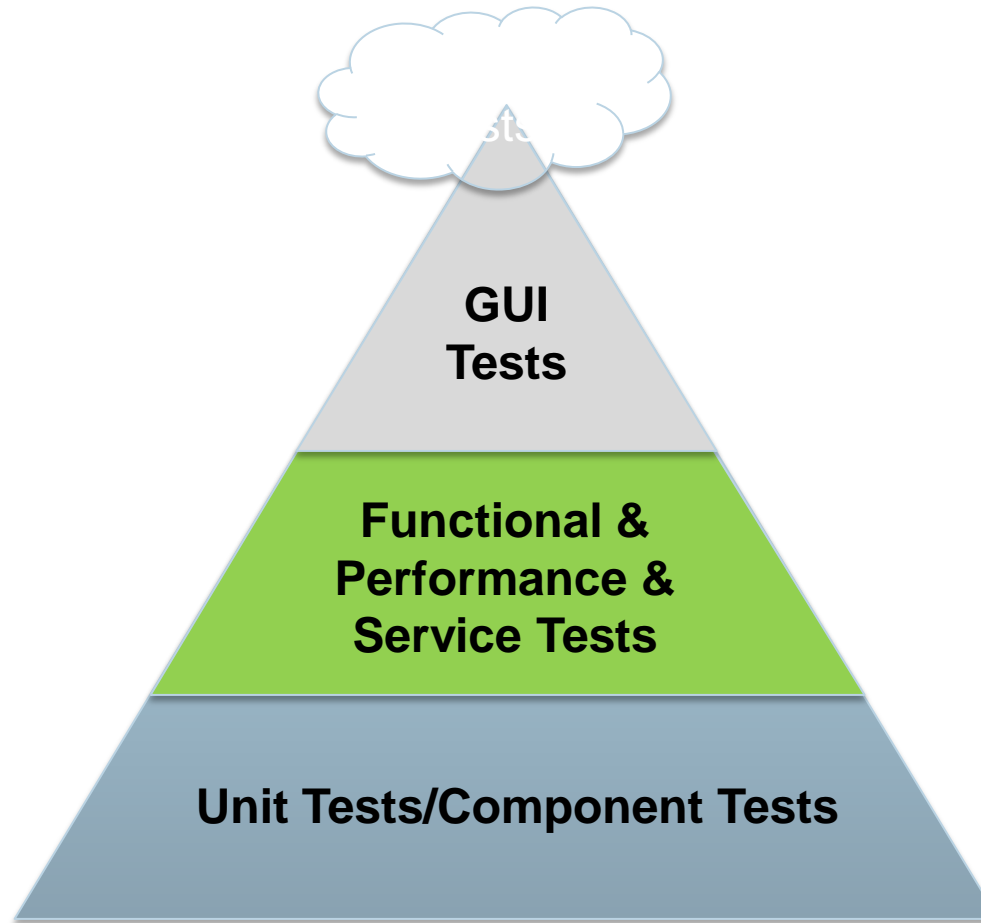


Agile



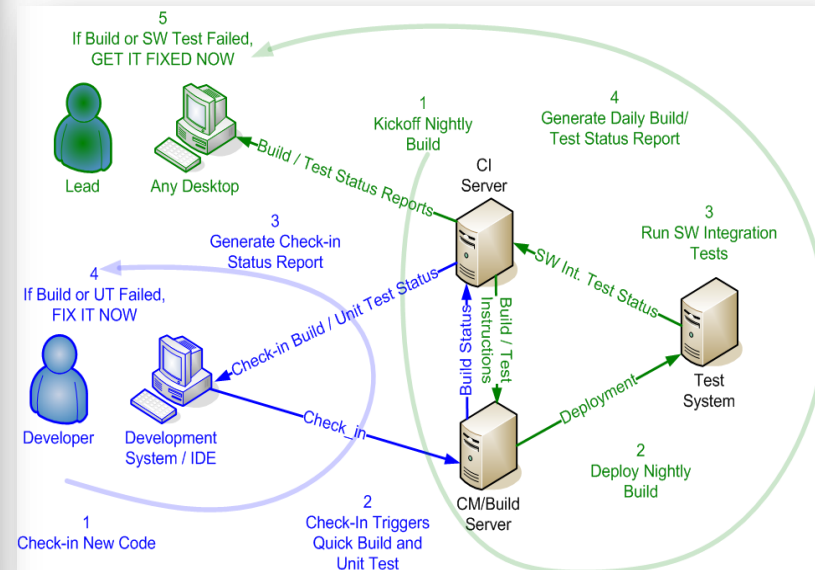
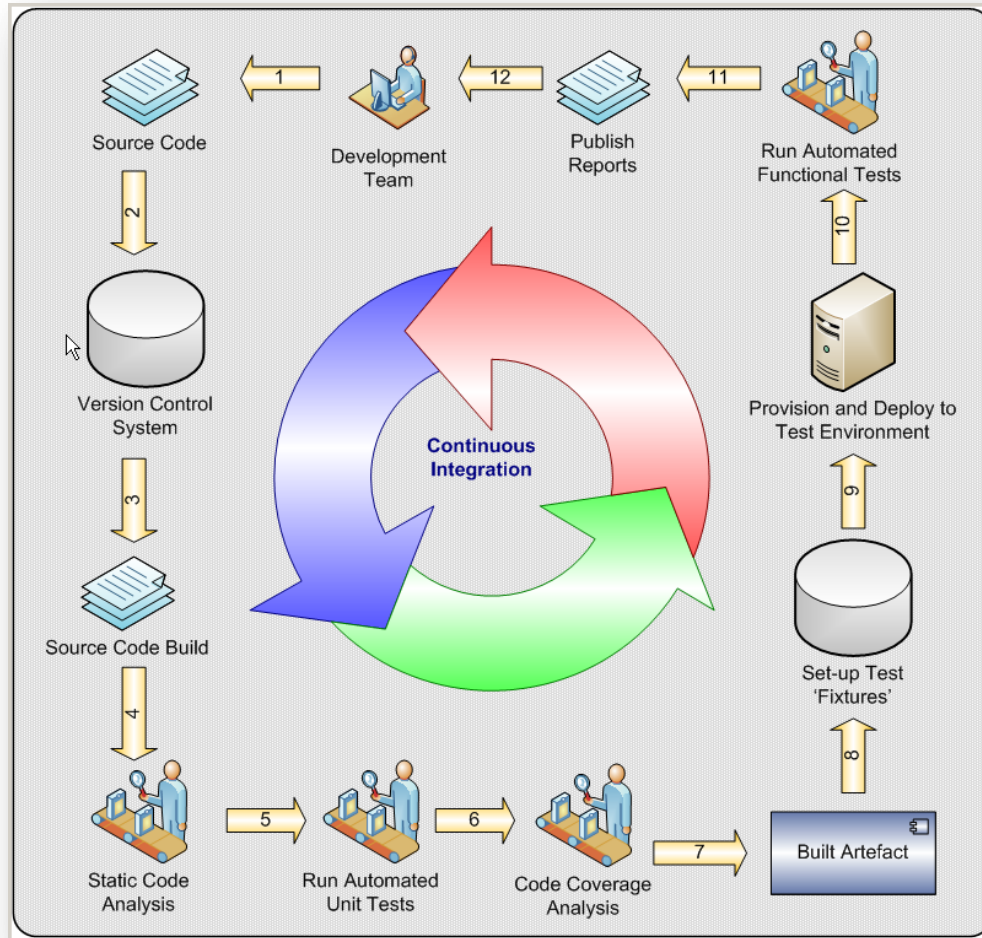
Agile produces working, tested, and deployable software sooner

Test Automation Pyramid



Goal is to achieve 100% automation at the Unit Level – where the best ROI occurs

Continuous integration and test



Continuous Integration and Testing environment using COTS, Open Source CI tool

[Jenkins](#)
[New Job](#)
[Manage Jenkins](#)
[People](#)
[Build History](#)
[Edit View](#)
[Project Relationship](#)
[Check File Fingerprint](#)
[Leader board](#)
[Claim Report](#)

Build Queue
 No builds in the queue.

Build Executor Status
[glddapollo.goldlnk.rootlnk.net](#)
 1 Idle
[glddiupiter.goldlnk.rootlnk.net](#)
 1 Idle
[GXP-XPL-Demo-01.irad.net](#)
 1 Idle
[GXP-XPL-Export1.irad.net](#)
 1 Idle
[GXP-XPL-Hudson-Centos-Ittest-Slave01.irad.net](#)
 1 Idle
[GXP-XPL-Hudson-Centos-Unit-Slave01.irad.net](#)
 1 Idle
[irad2.nedc.na.baesystems.com](#)
 1 Idle
 2 Idle
 3 Idle
 4 Idle
[XPL-Hd-W2003-32.irad.net](#)
 1 Idle
[XPL-Hudsn-Fed01.irad.net](#)
 1 Idle
[XPL-Hudsn-Fed02.irad.net](#)
 1 Idle
[XPL-Hudsn-Vis32.irad.net](#)
 1 Idle

All	Branch-2.0.2.a	Clean	Code-Freeze	Components	Master Installer	Master Test	PS	WPS	Web Client	z-OLD-Branch-2.0.1.x	z-OLD-Branch-2.0.1.y	z-OLD-Branch-2.0.1.z	+
S	W	Job	Last Success	Last Failure	Last Duration								
		branch-2.0.1-code-freeze-build-and-test-deploy-2.0.1.z	4 mo 0 days (#80)	4 mo 0 days (#79)	1 hr 56 min								
		branch-2.0.1-code-freeze-build-and-test-deploy-2.0.1.z-JUPITER	4 mo 4 days (#71)	4 mo 5 days (#70)	3 hr 14 min								
		branch-2.0.1-components-dist-WinXP32-2.0.1.x	8 mo 20 days (#170)	8 mo 22 days (#167)	2 hr 0 min								
		branch-2.0.1-components-dist-WinXP32-2.0.1.y	7 mo 21 days (#40)	8 mo 1 day (#36)	2 hr 3 min								
		branch-2.0.1-products-dist-Win7-2.0.1.x	8 mo 19 days (#202)	N/A	31 min								
		branch-2.0.1-products-dist-Win7-2.0.1.y	7 mo 20 days (#55)	7 mo 28 days (#51)	31 min								
		branch-2.0.1-products-InstallWizard-WinXP-2.0.1.x	8 mo 25 days (#58)	N/A	6 min 26 sec								
		branch-2.0.1-products-InstallWizard-WinXP-2.0.1.y	7 mo 27 days (#19)	8 mo 3 days (#11)	6 min 40 sec								
		branch-2.0.1-products-InstallWizard-WinXP-2.0.1.z	4 mo 1 day (#30)	N/A	7 min 29 sec								
		branch-2.0.1-products-MasterInstaller-install-intTest-webTest-asService-WinXP32-2.0.1.x	8 mo 19 days (#189)	8 mo 24 days (#184)	1 hr 25 min								
		branch-2.0.1-products-MasterInstaller-install-intTest-webTest-asService-WinXP32-2.0.1.y	7 mo 20 days (#39)	8 mo 0 days (#34)	2 hr 2 min								
		code-freeze-build-and-test-2.0.2.a	18 hr (#263)	6 days 22 hr (#259)	2 hr 42 min								
		components-dist-2.0.2.a	5 days 19 hr (#161)	23 days (#145)	2 hr 10 min								
		install-release-2.0.1.20110303-Demo-VM-WinXP32	1 yr 1 mo (#35)	1 yr 1 mo (#34)	1 hr 13 min								
		install-release-Demo-Export	1 mo 11 days (#35)	1 mo 11 days (#34)	1 hr 19 min								
		products-dist-2.0.2.a	18 hr (#181)	8 days 19 hr (#174)	35 min								
		products-InstallWizard-2.0.2.a	11 hr (#198)	5 days 2 hr (#191)	1 min 46 sec								
		products-MasterInstaller-install-asService-webTest-BRANCH-2.0.2.a	17 hr (#217)	N/A	57 min								
		trunk-build-code-freeze-build-and-test	6 hr 48 min (#340)	11 hr (#339)	3 hr 39 min								
				1 day 10 hr (#71)	1 hr 18 min								

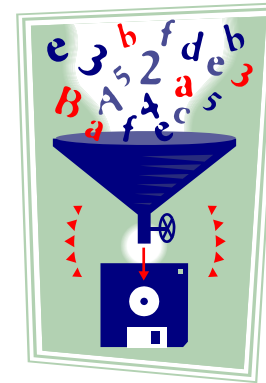
Constant measure of quality tested

Agile with Continuous Integration and Test

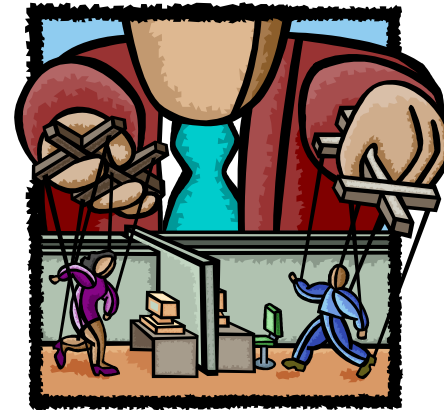
- When an capability development phase is planed, time is held “fixed” within the iterations (i.e., multiple four week Agile Scrums)
 - It becomes *obvious* at the daily meetings (both by CI&T automated results and discussions with the programmers) where the difficulties are occurring
 - Peer / Team relationships foster a culture of feedback and improvement
 - Schedule adherence or deviations is near real-time
- Actual cost are accounted for daily and reviewed weekly
 - Actual costs rise and fall proportionally to the degree of difficulty difference from the “Planned” tasks
- Quality of the software under development is monitored nightly by CI&T
 - Metrics collected show trends and areas of concern
 - Decisions can be made with insight about high risk areas

Earned Value Management conundrum with Agile

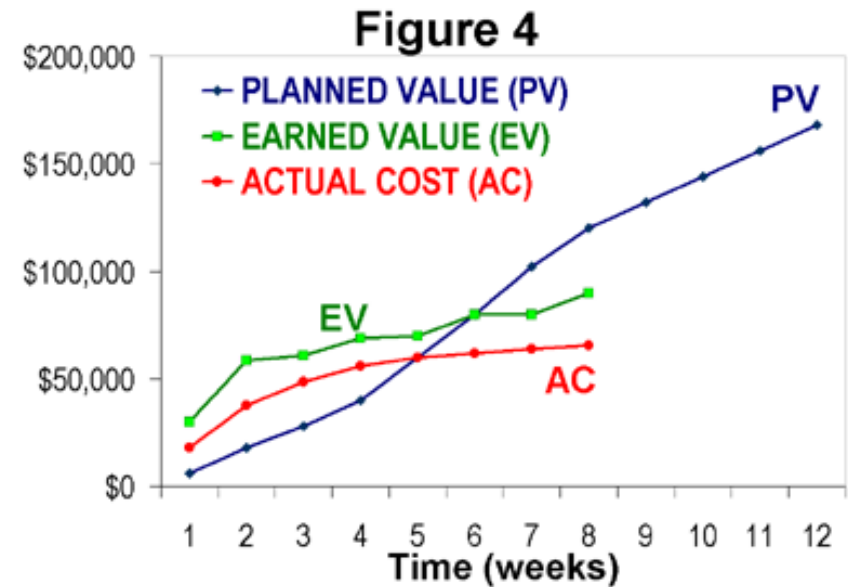
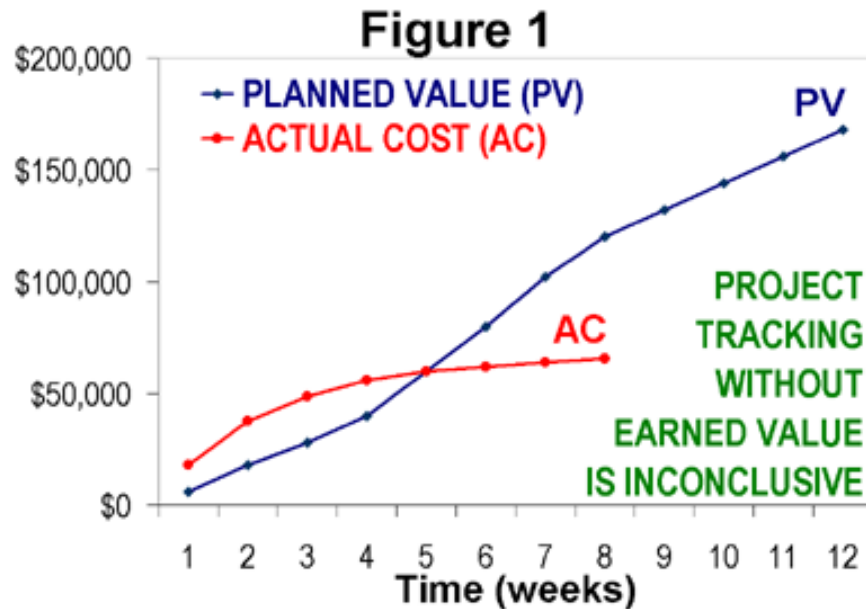
- Because EVM requires quantification of a project plan, it is often perceived to be inapplicable for Agile software development projects



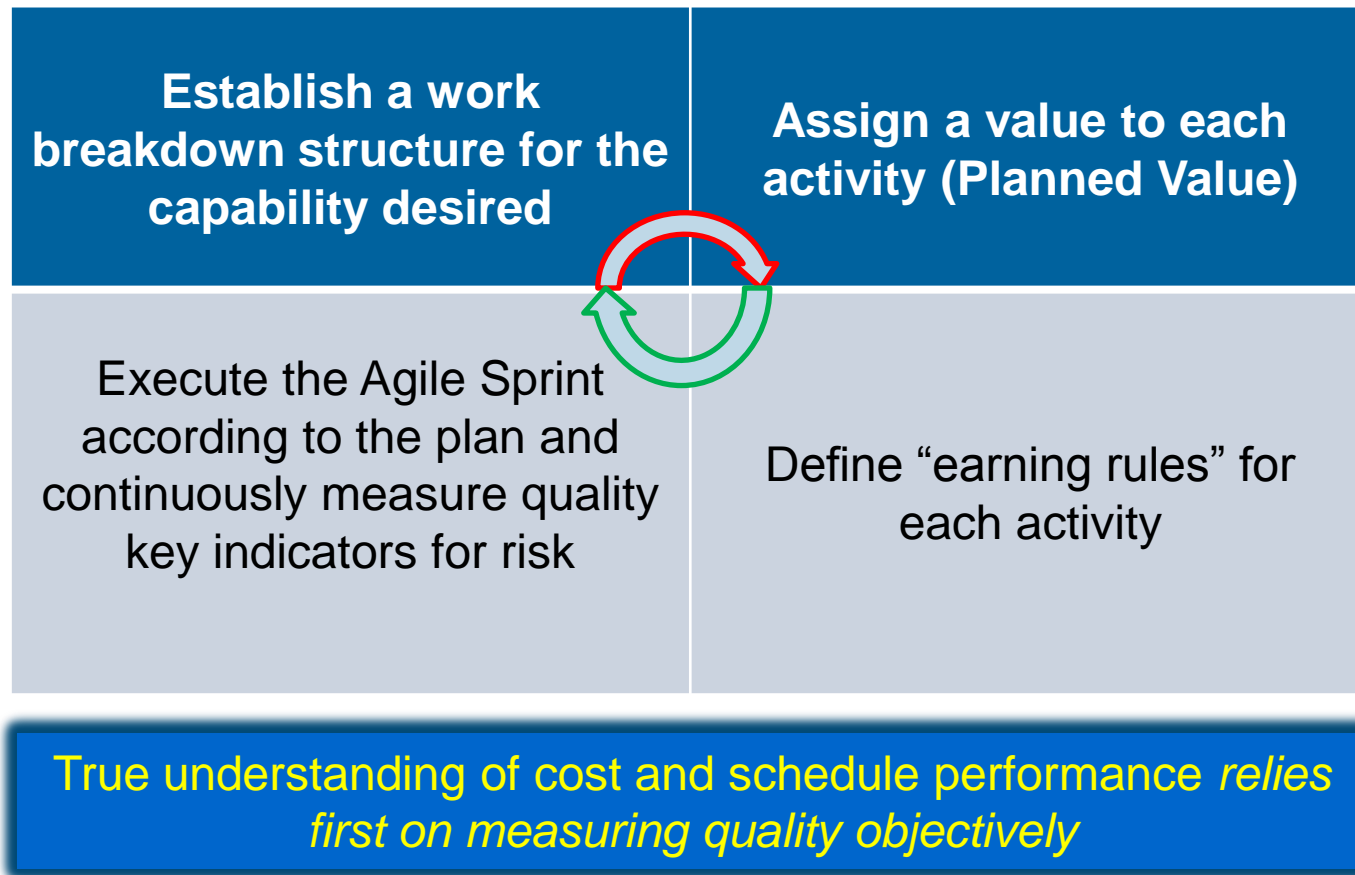
- However, another school of thought holds that all work can be planned, even if in weekly time boxes or other short increments



With EV the status is inconclusive



Agile EV



Risk becomes visible

$$PVR = PVi_1 + PVi_2 + \dots + PVi_n$$

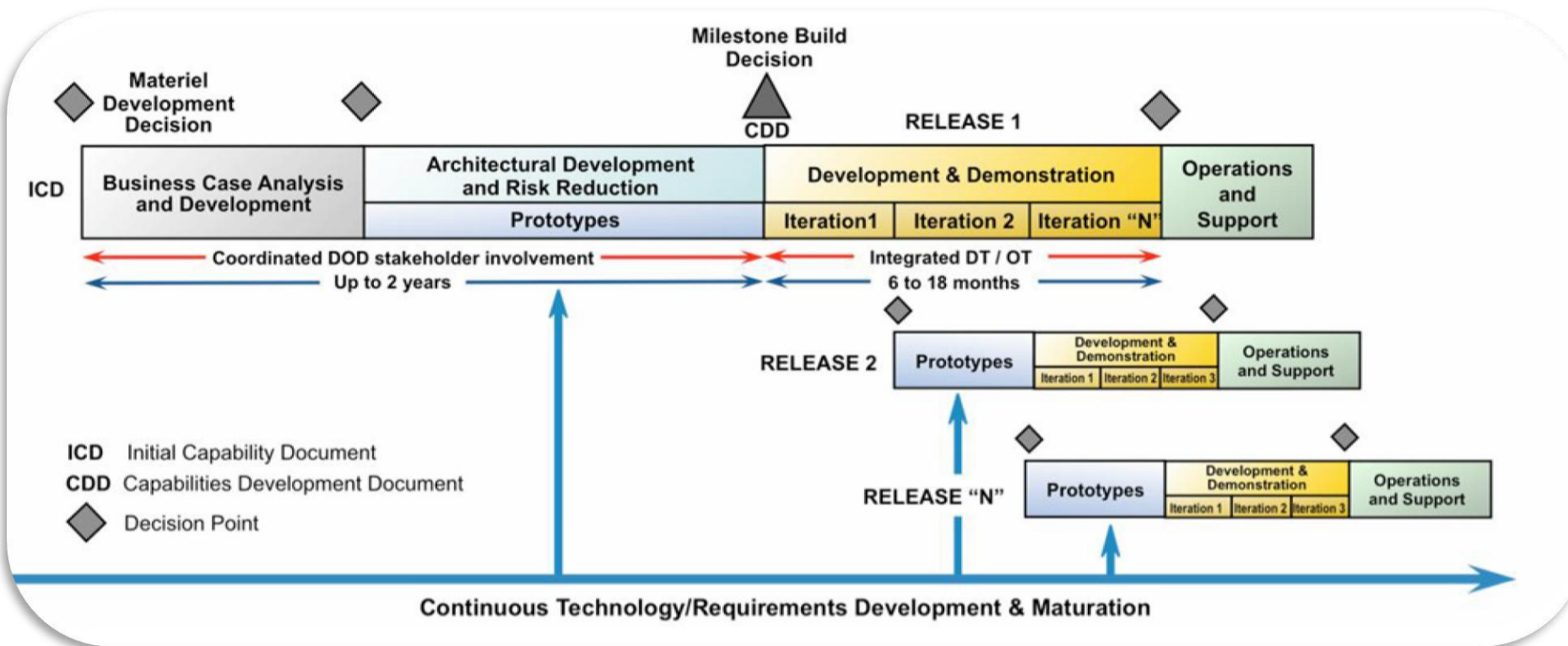
Planned Value of the release (PVR) is maintained constant (constrained cost and time) by allowing PVi to be modified based on efficiencies, enlightenment, or risks realized/avoided (both pos / neg)

Since agile EV is the measure of schedule and cost adherence to the PVi, software intensive risks becomes visible based upon the *degree of difficulty difference between the PVi and EVa*

$$EVa = \sum_{start}^{current} PVi$$

Change is coming

FY2010 NDAA Section 804



The Next Sprint has already started

- ☑ constant measure of schedule achieved
 - ☑ constant measure of actual cost incurred
 - ☑ constant measure of quality tested
-
- ☑ Agile Earned Value



Risk is actionable with Agile processes

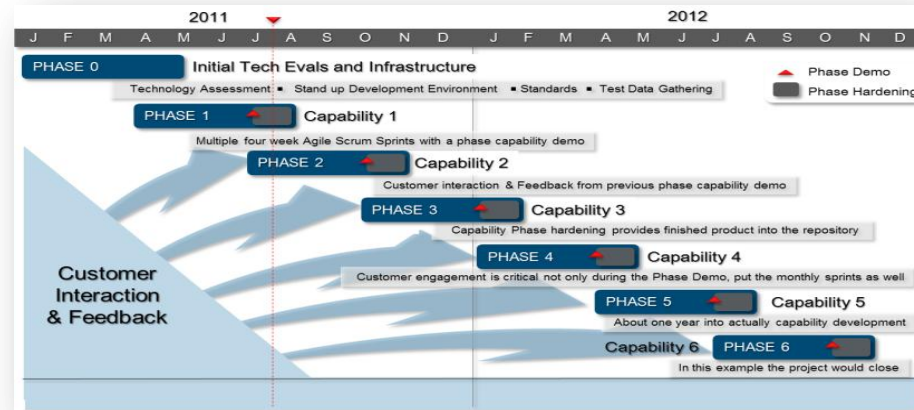
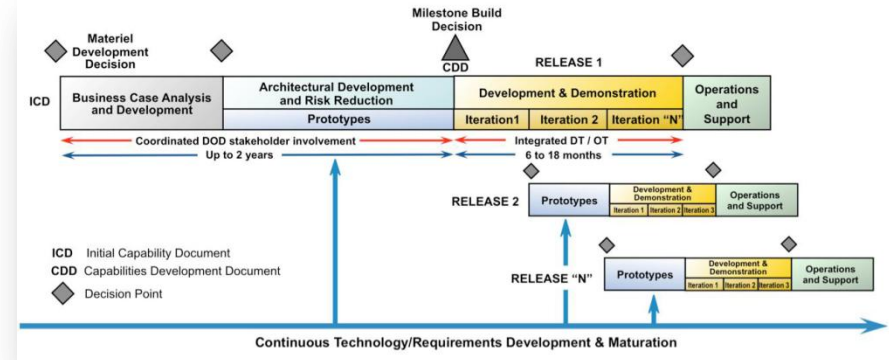
Innovation comes with agile EVMS

A project plan is developed that identifies work to be accomplished (work breakdown structure) both at the release level and with specific details at the iteration levels

A valuation of planned work at the release level, Planned Value “release” (PVr)

A pre-defined set of “earning rules” (metrics) to quantify the accomplishment of work called Earned Value (EV)

Prior to the start of the next capability iteration phase, the PVr remains constant (can always tell where you have been), but the Planned Value iteration (PVi) is adjustable to ensure that EVa is measuring the right items



Innovation comes with agile EVMS

Agile Scrums within an iteration phase provides actual cost information (c) and schedule (s) earnings as they are tightly coupled to the quality test event

Week 1	Mon	Tues	Wed	Thrs	Fri
Team			daily SCRUM	daily SCRUM	
Leads & CE	Story Prioritization		SCRUM of SCRUMS	SCRUM of SCRUMS	
Leads	Move Stories into JIRA				
		Move Tasks into JIRA			
Team	Bugs & Improvements				Off Friday
		Design, Deliver, Accept - Update JIRA Status daily			
All		Backlog prep for next Sprint			
PM	Determine Velocity / Feedback Loop to Planning		Weekly Team Meeting	Status GreenHopper Tasks & Stories	
Week 2	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS
Team	Bugs & Improvements				
		Design, Deliver, Accept - Update JIRA Status daily			
All		Backlog prep for next Sprint			
PM			Weekly Team Meeting	Status GreenHopper Tasks & Stories	
Week 3	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	
Team	Bugs & Improvements				Off Friday
		Design, Deliver, Accept - Update JIRA Status daily			
All		Backlog prep for next Sprint			
PM			Weekly Team Meeting	Status GreenHopper Tasks & Stories	
Week 4	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	
Leads & CE		Propose Next-Sprint Stories, Review Backlog			
Team	Bugs & Improvements				JIRA Close-out
		Design, Deliver, Accept - Update JIRA Status daily			Sprint Release / Design Review / Demo
All		Backlog prep for next Sprint			Retrospective
PM			Weekly Team Meeting	Status GreenHopper Tasks & Stories	Run Final Reports / Update Velocity

Continuous integration and test using automated test tools provides “continuous” monitoring of the build progress and flags areas of concern prior to the Scrum demo event (Q)

Job	Last Success	Last Failure	Last Duration
branch-2.0.2-a	4 min 0 days (820)	4 min 0 days (820)	1 hr 50 min
branch-2.0.1-code-freeze-build-and-test-deploy-2.0.1-a-307176	4 min 4 days (821)	4 min 5 days (820)	3 hr 14 min
branch-2.0.1-components-dist-Win072-2.0.1-a	8 min 20 days (8170)	8 min 22 days (8167)	2 hr 0 min
branch-2.0.1-components-dist-Win072-2.0.1-a	7 min 21 days (840)	8 min 1 day (836)	2 hr 2 min
branch-2.0.1-products-dist-Win07-2.0.1-a	8 min 19 days (8202)	N/A	30 min
branch-2.0.1-products-dist-Win07-2.0.1-a	7 min 20 days (833)	7 min 28 days (831)	30 min
branch-2.0.1-products-dist-Win07-2.0.1-a	8 min 25 days (838)	N/A	6 min 26 sec
branch-2.0.1-products-dist-Win07-2.0.1-a	7 min 27 days (833)	8 min 3 days (811)	6 min 40 sec
branch-2.0.1-products-dist-Win07-2.0.1-a	4 min 1 day (830)	N/A	7 min 29 sec
branch-2.0.1-products-dist-Win07-2.0.1-a	8 min 19 days (8188)	8 min 24 days (8184)	1 hr 25 min
branch-2.0.1-products-dist-Win07-2.0.1-a	7 min 20 days (8230)	8 min 0 days (824)	2 hr 12 min
code-freeze-build-and-test-2.0.2-a	18 hr (8203)	8 days 22 hr (8223)	2 hr 42 min
components-dist-2.0.2-a	9 days 19 hr (8161)	23 days (8165)	2 hr 10 min
install-release-2.0.1-20110001-Components-Win072	1 yr 1 min (823)	1 yr 1 min (826)	1 hr 13 min
install-release-Demo-Report	1 mo 1 day (823)	1 mo 11 days (826)	1 hr 29 min
products-dist-2.0.2-a	18 hr (8161)	8 days 19 hr (8126)	35 min
products-install-Win07-2.0.2-a	11 hr (8126)	5 days 2 hr (8131)	1 min 46 sec
products-MasterInstaller-install-and-service-winTest-BRANCH-2.0.2-a	17 hr (8217)	N/A	57 min
trunk-build-code-freeze-build-and-test	6 hr 48 min (8260)	11 hr (8222)	3 hr 29 min
trunk-build-components-deploy	10 hr (8210)	3 day 10 hr (821)	1 hr 18 min